REMARKS

Claims 20-21 are pending in this application. By this Amendment, claims 9-12, 15 and 16 are canceled without prejudice to or disclaimer of the subject matter recited therein in favor of new claims 20-21. Support for the amended claim can be found, at least, on page 3, line 1 to page 8, line 11 of the specification as filed and Fig. 2A. No new matter is added.

Claims 9, 11 and 15 are rejected under 35 U.S.C. §103(a) over Japanese Patent Publication No. JP 2000-355766 to Kokusai in view of U.S. Patent No. 5,088,697 to Murakami. Claims 10, 12 and 16 are rejected under 35 U.S.C. §103(a) over to Kokusai in view of Murakami, and further in view of U.S. Patent Publication No. 2002/0066412 to Yao et al. ("Yao"). These rejections are respectfully traversed.

As admitted on page 3 of the Office Action, the alleged U-shaped formation in Kokusai is not by heat treatment, but by a mechanical Zagury process. As also admitted, the previously recited product-by-process limitations were not given patentable weight, but instead assessed for perceived resultant structure regardless of process formed. Additionally, the resultant benefit of "reduced slip dislocation" was not given patentable weight because it was not recited in the existing claims.

Because rejected claims 9-12, 15 and 16 are canceled, these rejections are moot. In there place, Applicants provide new claims 20-21, which recite methods with more particularity to address the above issues raised by the Examiner in the Office Action.

In particular, independent claim 20 provides a method of vapor phase growth (of a silicon epitaxial layer on a main surface of a silicon single crystal substrate) with reduced slip dislocation frequency, comprising: (1) providing a single crystal substrate of a certain minimum size; (2) selecting (for use) a susceptor having a body section and a pocket, the susceptor pocket having... an initial maximum depth D and after heat treatment having a reduced depth (D - ß) caused by inverted U-shape warping of the body section to be less than

0.4 mm; (3) mounting the silicon single crystal substrate over the pocket; and (4) performing a vapor phase growth of a silicon epitaxial layer on the main surface of the substrate with reduced slip dislocation frequency by maintaining the maximum depth to be less than 0.4 mm.

As set forth in Applicants' background, various susceptors have been found to exhibit different levels of slip dislocation. Applicants have found that susceptors can warp during heat treatment (such as during coating of the SiC layer) in an inverted U-shape as shown in Fig. 2A, or in a U-shape as in Fig. 3. Because the vapor growth process itself is a process conducted at high heat, it also is considered a heat treatment that can affect the susceptor. Thus, even though a susceptor pocket may be considered to be properly sized for uniform heat distribution (such as a pocket of less than 0.4 mm), the vapor growth process itself may result in further warpage of the susceptor and a change in pocket depth.

As shown in Applicants' Table 1, if the warpage (U-shaped) occurs and the pocket depth increases, an increase in undesirable slip dislocation can occur. However, if warpage occurs in an inverted U-shape, the pocket depth decreases, which does not affect slip dislocation as shown in Table 1. Based on this understanding, Applicants recognized that if a susceptor is chosen that has already undergone heat treatment and has been found to result in an initial warpage of the body section in an inverted U-shape (Fig. 2A), any warpage that occurs during subsequent vapor growth processing will also occur in this same predisposed direction. Thus, any warpage from this type of susceptor will always result in a decrease in pocket depth due to the warpage, which will not have an adverse affect on slip dislocation for the substrate on which vapor growth is carried out.

Kokusai, Murakami and Yao fail to appreciate this problem or its solution. As admitted, the susceptor of Kokusai is formed to have crevice 32 by a mechanical Zagury process, not a heat treatment. As previously argued, given the described structure of

Kokusai's susceptor, one would not have known in advance what affect the vapor growth heat treatment would have on the susceptor. That is, in Kokusai, it is not known which direction the susceptor will warp. Thus, during vapor phase growth, the susceptor may experience warpage inward to increase the depth of the pocket and may thus experience increase in slip dislocation. It is thus possible for the susceptor to warp in a U-shape which would cause an increase in pocket depth and increased slip dislocation.

Kokusai thus also fails to teach selection of a susceptor that has undergone warpage in an inverted U-shape prior to the vapor growth, so as to have a predisposition for warpage in this acceptable warpage direction that ensures that a maximum pocket depth to prevent slip dislocation will not be exceeded. This resultant property cannot be assured with Kokusai.

Thus, Kokusai fails to teach each and every method step recited in independent claim 20. Murakami and Yao fail to overcome the deficiencies of Kokusai with respect to independent claim 20. Therefore, claim 20 and claim 21 dependent therefrom distinguish over Kokusai, Murakami and Yao.

For at least the above reasons, Kokusai alone or in view of Murakami and Yao does not disclose or suggest the subject matter of independent claim 20, as amended, or claims dependent therefrom. Accordingly, claims 20 and 21 are believed to be allowable.

In view of the foregoing, it is respectfully submitted that this application is in condition for allowance. Favorable reconsideration and prompt allowance of claims 20-21 are earnestly solicited.

Should the Examiner believe that anything further would be desirable in order to place this application in even better condition for allowance, the Examiner is invited to contact the undersigned at the telephone number set forth below.

Respectfully submitted,

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Attachment:
Request for Continued Examination

Date: December 18, 2008

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